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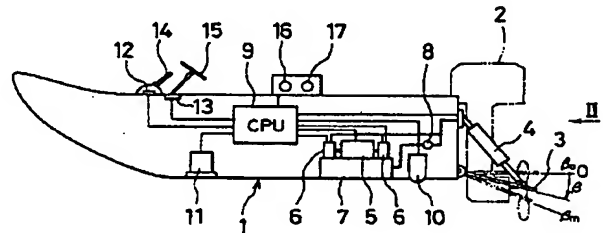
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(54)【発明の名称】 船外装置の制御装置

(57)【要約】

【目的】 船体や船外機の種類の如何にかかわらず、それぞれの船舶が個々に有する特性に応じて最適の航走を保証するようにした船外装置の制御装置を提供すること。

【構成】 船外機自体2又は別に取り付けたフラップ3を傾動させるチルト装置4を設け、該チルト装置4により傾動角 β を、船体の艇速 v に応じて艇角 θ を最適にするように操作する制御部9を設けた船外装置において、前記制御部9に、1種類以上の任意の加速航走による試走に基づき、それぞれ前記艇速 v と前記傾斜角 β との最適関係を設定した複数の制御パターンを作成記憶させる学習機能を具備させ、該学習機能から得られた複数の制御パターンに基づき本航走の艇角制御を行うようにした船外装置の制御装置。。



【特許請求の範囲】

【請求項 1】 船体の尾部に船外機を取り付けると共に、該船外機自体又は別に取り付けたフラップを傾動させるチルト装置を設け、該チルト装置により前記船外機自体又はフラップの傾斜角を、船体の艇速に応じて艇角を最適にするように操作する制御部を設けた船外装置において、前記制御部に、1 種類以上の任意の加速航走による試走に基づき、それぞれ前記艇速と前記傾斜角との最適関係を設定した複数の制御パターンを作成して記憶させる学習機能を具備させ、該学習機能から得られた複数の制御パターンに基づき本航走の艇角制御を行う構成からなる船外装置の制御装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、船外装置の制御装置に関し、さらに詳しくはそれぞれの船舶が個々に有する特性に応じて最適の艇角での航走を可能にするようにした船外装置の制御装置に関する。

【0002】

【従来の技術】船体の尾部に船外機を取り付けて航走を行うようにした船舶では、その艇速によって船首の水面に対する浮き上がり角（艇角）が著しく変化する。しかも、艇角は船体が水面から受ける抵抗にほぼ比例し、艇速が大いに影響を受けるようになっている。一方、船体の艇角は、船体尾部に設けた船外機の傾斜角によって大きく変化し、船外機下端の推進器がアップするように傾斜角を変化させると艇角が大きくなり、ダウンするように変化させると艇角が小さくなるようになっている。

【0003】従来、特開昭 61-12498 号公報や特開平 2-237893 号公報などに提案されるように、上記のような特性を利用することによって、船外機の傾斜角を燃料消費率を最も小さくする艇角にするように制御して、経済的な航走ができるようにした制御装置が提案されている。しかし、船体の艇角は、船底の形状、重心の位置、積荷の状況、取り付けられた船外機の種類などの要因によって様々に変化するものであるため、その制御条件は全ての船舶に対して一律に決まるものではない。したがって、上述した従来の制御装置では、あらゆる船舶に対して常に最高の効率を発揮できるとはいえず、平均的な性能しか発揮することができないのが実情であった。

【0004】

【発明が解決しようとする課題】本発明の目的は、上述した従来の問題を解消し、船体や船外機などの種類の如何にかかわらず、それぞれの船舶が個々に有する特性に応じて最適の航走を保障できるようにした船外装置の制御装置を提供することにある。

【0005】

【課題を解決するための手段】上記目的を達成する本発明からなる船外装置の制御装置は、船体の尾部に船外機

を取り付けると共に、該船外機自体又は別に取り付けたフラップを傾動させるチルト装置を設け、該チルト装置により前記船外機自体又はフラップの傾斜角を、船体の艇速に応じて艇角を最適にするように操作する制御部を設けた船外装置において、前記制御部に、1 種類以上の任意の加速航走による試走に基づき、それぞれ前記艇速と前記傾斜角との最適関係を設定した複数の制御パターンを作成して記憶させる学習機能を具備させ、該学習機能から得られた複数の制御パターンに基づき本航走の艇角制御を行う構成からなることを特徴とするものである。

【0006】このように本航走に先立つ学習機能によって当該船舶だけに適合する制御パターンを作成するため、船体の形状、構造或いは船外機の種類の如何にかかわらず、それぞれの船舶が個々に有する特性に応じて最適の航走を保障することができるようになる。

【0007】

【実施例】図 1 及び図 2 は、本発明の制御装置を装備した小型船舶（ボート）の概略を示すものである。1 は船体であり、その船体尾部の中央に船外機 2 が取り付けられ、また左右両側に一對のフラップ 3、3 が油圧シリンダ 4、4 をチルト装置として傾動可能に取り付けられている。左右の油圧シリンダ 4、4 は、それぞれポンプ 5 から電磁弁 6、6 を介して作動油が供給されることにより伸縮作動し、フラップ 3、3 を揺動させるようにしている。7 は作動油を貯留した油タンク、8 はリリーフ弁である。リリーフ弁 8 は、油圧シリンダ 4 が所定の圧力になったとき余剰の作動油を油タンク 7 へ還流させて、油圧シリンダ 4 の内圧が高圧にならないようする。

【0008】9 はマイクロコンピュータから構成された制御部である。制御部 9 には、艇速 v を検知する速度センサ 10、艇角 θ （水面に対する船体の傾斜角；図 4 参照）を検知する傾斜センサ 11、スロットル 14 に連動してスロットル開度 y を検知するスロットルセンサ 12、ハンドル 15 に連動してハンドル角度（舵角 α ）を検知する舵角センサ 13 などが接続され、それぞれの検知信号が入力されるようになっている。また制御部 9 からは、上記ポンプ 5 や電磁弁 6 に制御信号が出力され、その制御に応じた作動油によって油圧シリンダ 4 を作動し、フラップ 3 の傾斜角 β （船体の基準線に対する傾斜角度；図 4 参照）を変化させるようになっている。この傾斜角 β は初期傾斜角（基準） β_0 と最大傾斜角 β_m の範囲で変化するようにしてある。

【0009】16 はスタートスイッチ、17 は選択スイッチである。スタートスイッチ 16 は、後述するデータ収集の開始、終了を制御部 9 に入力するもので、一度押すと制御操作がスタートし、再度押すと制御操作が終了するようにしてある。また、選択スイッチ 17 は、そのオン、オフにより収集データの採用か否かを選択するようにしたものである。

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【0010】図3は、本発明の他の実施例からなる制御装置を装備した船舶を示す。この図3の装置では、フラップ3が設けられず、船外機2自体が油圧シリンダ4によって傾動操作させられ、その傾斜角 β が変化させられるようになっている。この船外機自体の傾斜角 β_0 も、初期傾斜角(基準) β_0 と最大傾斜角 β_m の範囲で変化するようにになっている。

【0011】上述のように構成された船舶は、航走中において制御部9が各センサ10、11、12、13からの検知信号に基づき、ポンプ5や油圧シリンダ4などのチルト装置を作動させることによりフラップ3または船外機2自体の傾斜角 β を変化させ、艇速度 v に応じて艇角 θ を最も効率のよい燃料消費率にするように制御する。

【0012】本発明の制御装置による艇角 θ の制御は、以下に説明するように本航走前に試走することによる学習機能により作成された制御パターンにより、傾斜角 β を変化させて行われるようになっている。本航走を行う前の学習機能による制御パターンの作成プロセスは、図5のフローチャートに従って実施され、(1)初期データ取込み、(2) $\theta-v$ 特性曲線を作成し、 θ_{\max} とその時の v を算出、(3) $v-\beta$ 線図からなる制御パターンの作成の順に行われる。

【0013】最初の(1)初期データ取込みは、通常加速と急加速との少なくとも二通りの試走について行い、それぞれ図6(A)、(B)及び図7(A)、(B)のような時間-艇角($t-\theta$)、時間-艇速($t-v$)の特性曲線を作成する。図6中に示す θ_{m1} は通常加速試走時の艇角 θ の最大、 θ_{m2} は急加速試走時の最大であり、 t_{m1} 、 t_{m2} はそれぞれ通常加速試走と急加速試走における発進から艇角 θ が最大になるまでの時間である。また、図7中に示す v_{m1} 、 v_{m2} は、通常加速試走と急加速試走における発進から時間 t_{m1} 、 t_{m2} を経過したときの艇速である。

【0014】これらの収集データに基づいて、上記(2)の $\theta-v$ 特性曲線を図8(A)、(B)のように作成し、艇角 θ の最大とその時の艇速 v を算出する。最後に、これらのデータに基づき、上記(3)の制御パターン($v-\beta$ 線図)を作成する。この制御パターンとしては、例えば図9(A)の通常加速用のパターンA、図9(B)の中加速用のパターンB、(C)の急加速用のパターンCなどのように複数の制御パターンを作成する。

【0015】図5のフローチャートに従って、上述した通常加速試走や急加速試走を実施する場合において、ステップ51で判断するデータ収集条件としては、①フラップが上がっているか?(船外機の場合は、初期航走位置か?)、②ギヤは前進か?(後進の場合は実施しない)、③艇速は0(km/m)か?、④スロットルは全開か?、⑤波はないか?(外乱を避けて行うため)、⑥舵

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角は0か?(舵角があるときは、条件がくるいやすいため)、⑦積載条件-操船者だけか?などが考慮される。

【0016】これらの条件が全てイエス(Yes)になると、スイッチ16を押し、ステップ52を実行して上述した試走を行う。ステップ53でデータ収集を終了すると、ステップ54でその収集データの良否を判定したのち、精度の高い制御パターンを得るためにステップ55のように最低2回のデータ収集を行うようにするのがよい。そして、上述のように複数の制御パターンを作成し、これを制御部9に記憶させて終了する。

【0017】本航走のときの艇角制御は、上述のような学習機能によって得られた複数の制御パターンに基づいて、図10のフローチャートのように実施され、フラップ又は船外機自体の傾斜角 β が自動制御される。この制御により船舶は、その船舶が固有する特性に応じて最も効率のよい艇角となって航走を行う。図10のフローチャートによる本航走の艇角制御は、次のようにして行われる。まず、ステップ101により積載条件の変化に基づく艇角 θ の変化が入力される。次いで、ステップ102によりギヤが前進のときだけ艇角制御されるようになっている。また、ステップ103、104により、舵角 α が所定の常数 α_0 以上になっておらず、艇速 v が制御最低速度 v_0 よりも大きいときに限って制御するようにする。ただし、艇速 v が制御最低速度 v_0 よりも小さいときでも、ステップ105によりスロットル開度 γ が所定の開度 γ_m よりも大きいときは、制御が行われるようになっている。

【0018】上述した諸条件が満足されると、ループ106により傾斜角 β が初期傾斜角常数 β_0 よりも大きいことを確認して、フラップ又は船外機の初期位置(着水)の傾斜角 β の設定が行われる。次いで、ステップ107によるスロットルの開速度 γ' の開速度常数 γ_0 に対する大小関係およびステップ108、109により艇角 θ の最大角度 θ_m に対する大小関係の判断に応じて、複数の制御パターンA、B、Cの中から適切な制御パターンが選択されて、最も効率のよい艇角制御が行われる。

【0019】なお、上述した実施例では、学習機能で行う試走として通常加速と急加速との2種類を行ったが、この試走としては任意の1種類の加速航走であってもよく、その試走から一定の率の加算又は減算によって他の加速航走を設定して、上記2種類の場合と同様にすることができる。当然、3種類以上の加速航走によって学習機能を行うようにしてもよい。

【0020】

【発明の効果】上述したように、本発明の制御装置によると、本航走に先立つ学習機能によって当該船舶だけに適合する制御パターンを複数作成し、この制御パターンにより本航走の制御を行うようにするため、船体の形

状、構造或いは船外機の種類の如何にかかわらず、それぞれの船舶が個々に有する特性に応じて最も効率的な航走を保障することができるようになる。

【図面の簡単な説明】

【図1】本発明による制御装置を装備した船舶の概略図である。

【図2】図1のII矢視図である。

【図3】本発明の他の実施例からなる制御装置を装備した船舶の概略図である。

【図4】艇角 θ 、傾斜角 β 、艇速 v などを説明する説明図である。

【図5】制御パターンを作成するときのフローチャートである。

【図6】(A) 通常加速試走による時間 t —艇角 θ の特性曲線図である。

(B) 急加速試走による時間 t —艇角 θ の特性曲線図である。

【図7】(A) 通常加速試走による時間 t —艇速 v の特性曲線図である。

性曲線図である。

(B) 急加速試走による時間 t —艇速 v の特性曲線図である。

【図8】(A) 通常加速試走による艇速 v —艇角 θ の特性曲線図である。

(B) 急加速試走による艇速 v —艇角 θ の特性曲線図である。

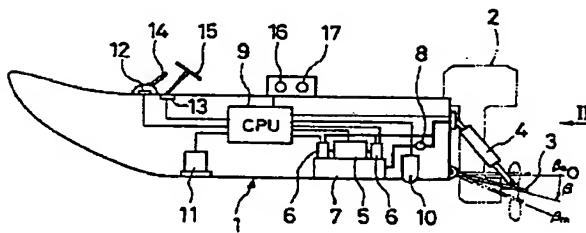
【図9】(A), (B), (C) それぞれ艇速 v —傾斜角 β 線図からなる制御パターンを示す図である。

【図10】本航走時の艇角制御を行うフローチャートである。

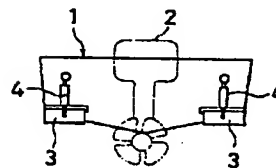
【符号の説明】

- | | | |
|------------------|----------|---|
| 1 船体 | 2 船外機 | 3 |
| 4 フラップ | | |
| 5 油圧シリンダ (チルト装置) | 6 ポンプ | |
| 7 速度センサ | 8 傾斜センサ | 9 |
| 10 スロットルセンサ | 11 舵角センサ | |
| 12 | | |
| 13 | | |

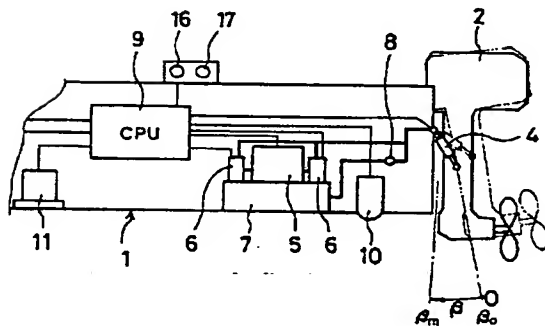
【図1】



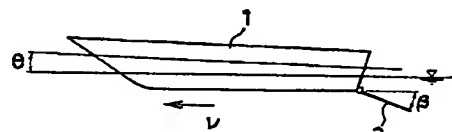
【図2】



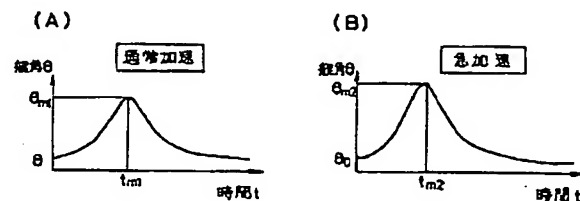
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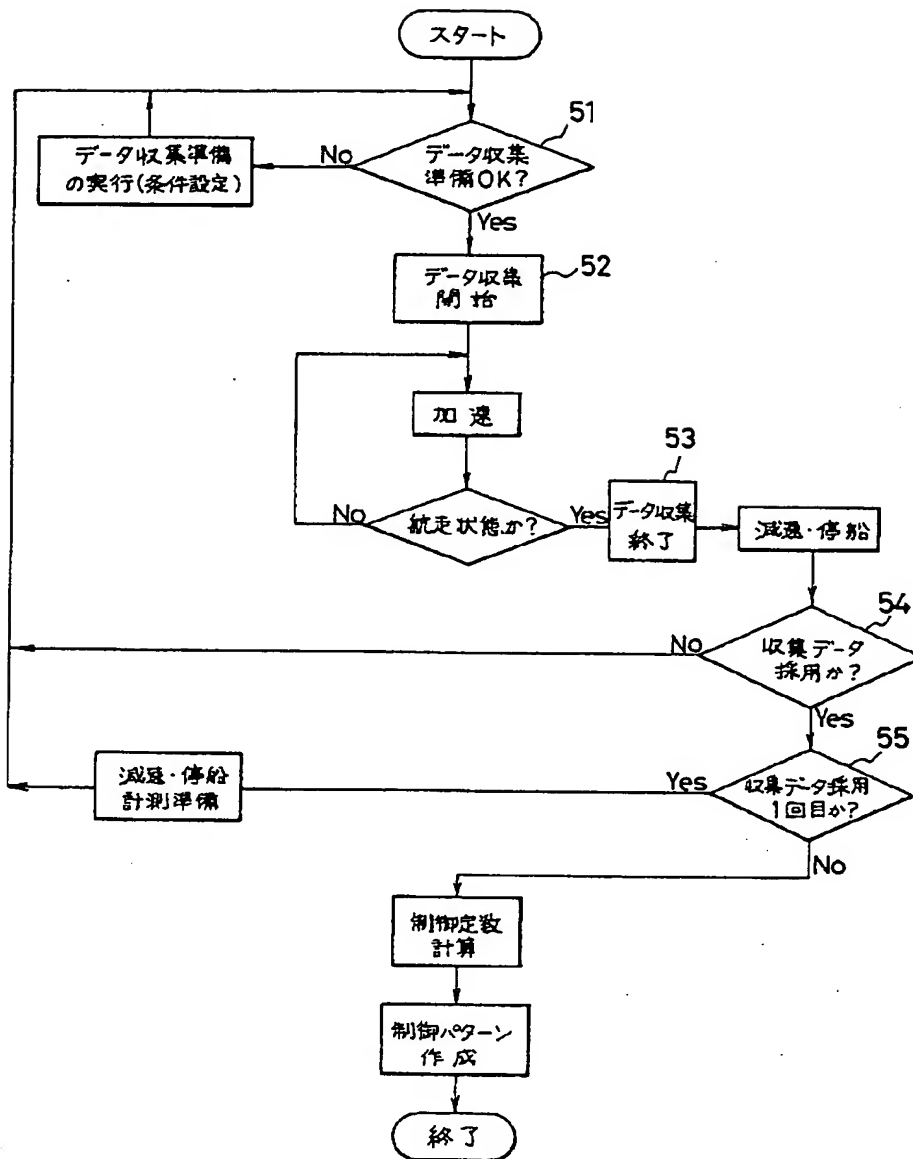
【図4】



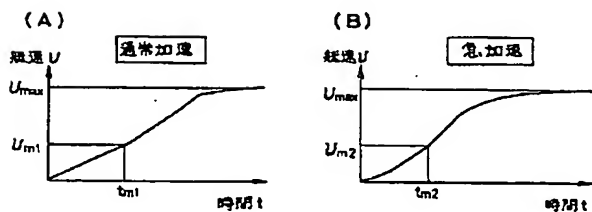
【図6】



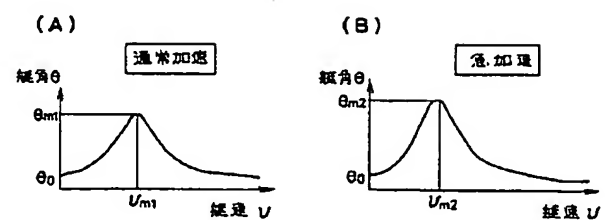
【図 5】



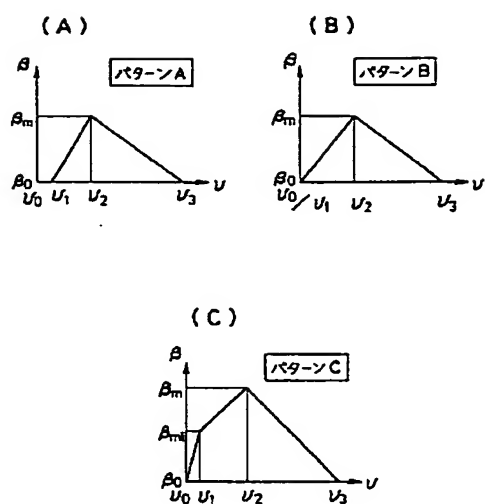
【図 7】



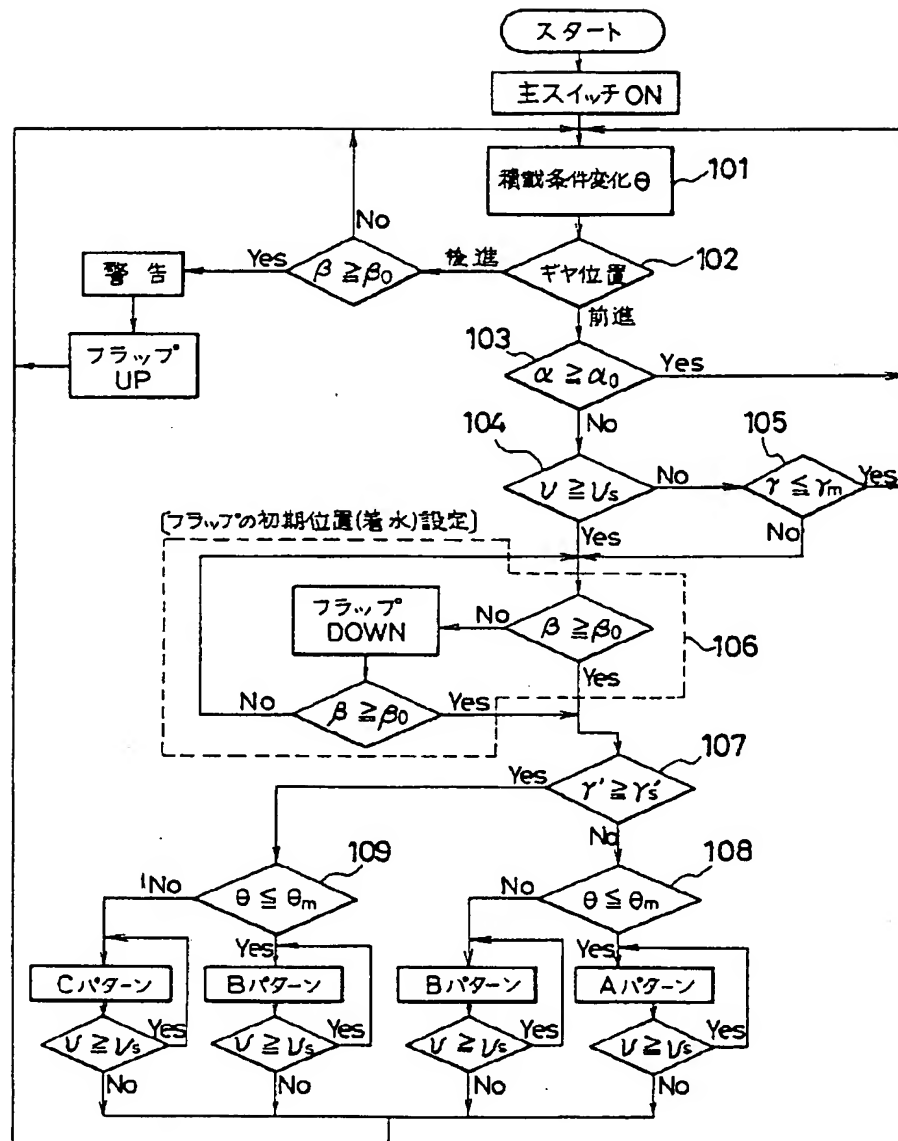
【図 8】



【図9】



【図10】





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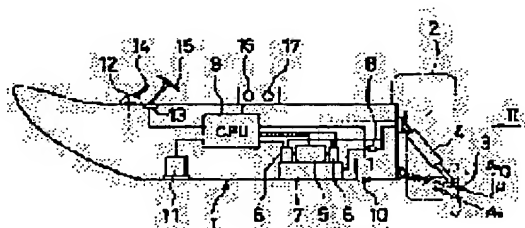
(72)Inventor : TACHIKAWA MAKOTO
IWAMOTO TADAMITSU

(54) CONTROL UNIT FOR OUTBOARD ENGINE APPARATUS

(57)Abstract:

PURPOSE: To provide a control unit for an outboard engine apparatus which assures an optimum sailing in accordance with characteristics of respective ships independently of any type of the hull or an outboard engine.

CONSTITUTION: In an outboard engine apparatus, which comprising a tilting device 4 for tilting an outboard engine per se 2 or a flap 3 mounted independently and a controller 9 for controlling a tilting angle β by means of the tilting device 4 so as to make an angle θ of a ship optimum, the controller 9 is provided with learning functions for making and storing a plurality of control patterns wherein optimum relations between a ship speed v and the tilting angle are set on the basis of test sailing such as one or more optional accelerating sailing. Thus, there is provided a control unit for an outboard engine apparatus which controls the ship inclination for a real sailing based on a plurality of control patterns attained from the learning functions.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

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CLAIMS

[Claim(s)]

[Claim 1] While attaching an outboard motor in a tail of a hull, tilt equipment to which the outboard motor itself [this] or a flap attached independently is made to tilt is formed. In equipment overboard which prepared a control section which operates a tilt angle of said outboard motor itself or a flap with this tilt equipment so that **** may be made the optimal according to **** of a hull A learning function which makes two or more control patterns which set the optimal relation of said **** and said tilt angle as said control section based on **** by acceleration sailing of one or more kinds of arbitration, respectively create and memorize is made to provide. A control unit of equipment overboard which consists of a configuration of performing **** control of this sailing based on two or more control patterns obtained from this learning function.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the control unit of the equipment overboard with which each marine vessel was made to enable sailing by the optimal **** according to the property which it has separately in more detail about the control unit of equipment overboard.

[0002]

[Description of the Prior Art] By marine vessel which was made to sail by attaching an outboard motor in the tail of a hull, the relief angle (****) over the water surface of a bow changes with the **** remarkably. And **** is proportional to the resistance which a hull receives from the water surface mostly, and **** is influenced dramatically. On the other hand, it changes with the tilt angles of the outboard motor which prepared **** of a hull in the hull tail a lot, and **** will become small if it is made to change so that **** may become large and it may be downed, if a tilt angle is changed so that the propeller of an outboard motor soffit may rise.

[0003] As conventionally proposed by JP,61-12498,A, JP,2-237893,A, etc., by using the above properties, it controls to make the tilt angle of an outboard motor into **** which makes specific fuel consumption the smallest, and the control unit which could be made to perform economical sailing is proposed. However, since **** of a hull is what changes with factors, such as a configuration of a ship's bottom, a location of a center of gravity, a condition of a load, and a class of attached outboard motor, variously, the control condition is uniformly decided to no marine vessels. Therefore, in the conventional control unit mentioned above, it cannot say that the highest effectiveness can always be demonstrated to all marine vessels, but the actual condition was able to demonstrate only the average engine performance.

[0004]

[Problem(s) to be Solved by the Invention] The object of this invention solves the conventional problem mentioned above, and each marine vessel is regardless of the class of a hull, outboard motor, etc. to offer the control unit of the equipment overboard which enabled it to secure the optimal sailing according to the property which it has separately.

[0005]

[Means for Solving the Problem] A control unit of equipment overboard which consists of this invention which attains the above-mentioned object While attaching an outboard motor in a tail of a hull, tilt equipment to which the outboard motor itself [this] or a flap attached independently is made to tilt is formed. In equipment overboard which prepared a control section which operates a tilt angle of said outboard motor itself or a flap with this tilt equipment so that **** may be made the optimal according to **** of a hull A learning function which makes two or more control patterns which set the optimal relation of said **** and said tilt angle as said control section based on **** by acceleration sailing of one or more kinds of arbitration, respectively create and memorize is made to provide. It is characterized by consisting of a configuration of performing **** control of this sailing based on two or more control patterns obtained from this learning function.

[0006] Thus, since a control pattern which suits only the marine vessel concerned by learning function before this sailing is created, according to a property which each marine vessel has

separately, the optimal sailing can be secured regardless of a configuration of a hull, structure, or a class of outboard motor.

[0007]

[Example] Drawing 1 and drawing 2 show the outline of the small marine vessel (boat) equipped with the control unit of this invention. 1 is a hull, and an outboard motor 2 is attached in the center of the hull tail, and the flaps 3 and 3 of a couple use oil hydraulic cylinders 4 and 4 as tilt equipment, and it is attached in right-and-left both sides possible [tilting]. The oil hydraulic cylinders 4 and 4 on either side carry out flexible actuation, and he is trying to make flaps 3 and 3 rock by supplying hydraulic oil through solenoid valves 6 and 6 from a pump 5, respectively. The oil tank with which 7 stored hydraulic oil, and 8 are relief valves. A relief valve 8 makes excessive hydraulic oil flow back to an oil tank 7 at the time of pressure ***** predetermined in an oil hydraulic cylinder 4, and is carried out as [turn into / the internal pressure of an oil hydraulic cylinder 4 / high voltage].

[0008] 9 is the control section which consisted of microcomputers. The speed sensor 10 which detects **** nu, the dip sensor 11 which detects **** theta (the tilt angle of the hull to the water surface; refer to drawing 4), the throttle sensor 12 which is interlocked with a throttle 14 and detects the throttle opening gamma, the rudder angle sensor 13 which is interlocked with a handle 15 and detects a handle angle (rudder angle alpha) are connected to a control section 9, and each detection signal is inputted into it. Moreover, a control signal is outputted to the above-mentioned pump 5 or a solenoid valve 6, with the hydraulic oil according to the control, an oil hydraulic cylinder 4 is operated and the tilt angle beta of a flap 3 (whenever [to the datum line of a hull / tilt-angle]; refer to drawing 4) is changed from a control section 9. This tilt angle beta is the initial tilt angle (criteria) beta 0. Maximum-angle-of-inclination betam It is made to have changed in the range.

[0009] 16 is a start switch and 17 is a selecting switch. Once the start switch 16 inputs into a control section 9 initiation of the data collection mentioned later, and termination and pushes them, control operation will start it, and control operation is ended if it pushes again. Moreover, a selecting switch 17 chooses whether it is adoption of collection data by the ON and OFF.

[0010] Drawing 3 shows the marine vessel equipped with the control unit which consists of other examples of this invention. With the equipment of this drawing 3 , a flap 3 is not formed, but outboard motor 2 the very thing is made to carry out tilting actuation by the oil hydraulic cylinder 4, and that tilt angle beta is changed. The tilt angle beta of this outboard motor itself is the initial tilt angle (criteria) beta 0. Maximum-angle-of-inclination betam It changes in the range.

[0011] When a control section 9 operates tilt equipments, such as a pump 5 and an oil hydraulic cylinder 4, based on the detection signal from each sensors 10, 11, 12, and 13 during sailing, the marine vessel constituted as mentioned above changes the tilt angle beta of a flap 3 or outboard motor 2 the very thing, and is controlled to make **** theta into the most efficient specific fuel consumption according to ***** nu.

[0012] Control of **** theta by the control unit of this invention is performed by changing the tilt angle beta with the control pattern created by the learning function by ****(ing) before this sailing so that it may explain below. It carries out according to the flow chart of drawing 5 , (1) initial-data incorporation and (2) theta-nu characteristic curve are created, and the creation process of the control pattern by the learning function before performing this sailing is thetamax. It is carried out in order of creation of the control pattern which consists nu at that time of calculation and a (3) nu-beta diagram.

[0013] The first (1) initial-data incorporation usually carries out about at least two kinds of **** of acceleration and sudden acceleration, and creates the characteristic curve of time amount-**** (t-theta) respectively like drawing 6 (A), (B), and drawing 7 (A) and (B), and time amount-**** (t-nu). Usually thetam1 shown in drawing 6 is the max of **** theta of an acceleration trial travel time, thetam2 is the max of a sudden acceleration trial travel time, and tm1 and tm2 are time amount until **** theta usually becomes max from the start in acceleration **** and sudden acceleration ****, respectively. Moreover, num1 shown in drawing 7 and num2 are **** when it has usually gone through time amount tm1 and tm2 from the start in acceleration ****

and sudden acceleration ****.

[0014] Based on these collection data, the theta-nu characteristic curve of the above (2) is created as shown in drawing 8 (A) and (B), and the maximum and **** nu at the time of **** theta are computed. Finally, based on these data, the control pattern (nu-beta diagram) of the above (3) is created. As this control pattern, two or more control patterns are created, for example like the pattern A for usual acceleration of drawing 9 (A), the pattern B for acceleration in drawing 9 (B), and the pattern C for sudden acceleration of (C).

[0015] According to the flow chart of drawing 5, as data collection conditions judged at step 51 when [which was mentioned above] usually carrying out acceleration **** and sudden acceleration **** ** Is the flap going up (in the case of an outboard motor)? Is it an initial sailing location? ** gear Advance or ? (in go-astern, it does not carry out) ** **** — 0 (km/m) — it is — ? and ** throttle — a close by-pass bulb completely — it is — aren't there ? and a ** wave (in order to carry out by avoiding disturbance)? ** rudder angle is 0 — do only ? (when there is rudder angle, conditions come — it cures — hurt) ** loading condition-navigation person [?]? **** is taken into consideration.

[0016] If all of these conditions become yes (Yes), **** which performed push and step 52 and mentioned the switch 16 above will be performed. After ending data collection at step 53 and judging the quality of the collection data at step 54, in order to obtain the high control pattern of precision, it is good to be made to perform at least two data collection like step 55. And create two or more control patterns as mentioned above, a control section 9 is made to memorize this, and it ends.

[0017] **** control at the time of this sailing is carried out like the flow chart of drawing 10 based on two or more control patterns obtained by the above learning functions, and the automatic control of the tilt angle beta of a flap or the outboard motor itself is carried out. It sails by this control by a marine vessel serving as most efficient **** according to the property in which that marine vessel carries out a proper. **** control of this sailing by the flow chart of drawing 10 is performed as follows. First, the change of **** theta based on change of loading conditions is inputted by step 101. Subsequently, **** control is carried out by step 102 only when a gear is advance. Moreover, the rudder angle alpha is the predetermined constant alpha 0 by step 103,104. It does not become above but **** nu is control minimum speed nus. It is made to control, whenever it is large. However, **** nu is control minimum speed nus. Even when small, the throttle opening gamma is predetermined opening gammam by step 105. Control is performed when large.

[0018] When the terms and conditions mentioned above are satisfied, the tilt angle beta is the initial tilt-angle constant beta 0 by the loop 106. A large thing is checked and setting out of the tilt angle beta of the initial position (splashdown) of a flap or an outboard motor is performed. subsequently — a step — 107 — depending — a throttle — open — speed — gamma — ' — open — speed — a constant — gamma — s — ' — receiving — size — relation — and — a step — 108,109 — maximum angle thetam of **** theta According to decision of size-related [receiving], a suitable control pattern is chosen out of two or more control patterns A, B, and C, and most efficient **** control is performed.

[0019] In addition, although two kinds such as acceleration and sudden acceleration were usually performed in the example mentioned above as **** performed by the learning function, as this ****, you may be one kind of acceleration sailing of arbitration, and from that ****, by addition or subtraction of a fixed rate, other acceleration sailing can be set up and can be made to be the same as that of the two above-mentioned kinds of cases. Naturally, three or more kinds of acceleration sailing may be made to perform a learning function.

[0020]

[Effect of the Invention] As mentioned above, in order according to the control unit of this invention to create two or more control patterns which suit only the marine vessel concerned and to control this sailing by the learning function before this sailing with this control pattern, according to the property which each marine vessel has separately, the most efficient sailing can be secured regardless of the configuration of a hull, structure, or the class of outboard motor.

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TECHNICAL FIELD

[Industrial Application] This invention relates to the control unit of the equipment overboard with which each marine vessel was made to enable sailing by the optimal **** according to the property which it has separately in more detail about the control unit of equipment overboard.

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PRIOR ART

[Description of the Prior Art] By marine vessel which was made to sail by attaching an outboard motor in the tail of a hull, the relief angle (****) over the water surface of a bow changes with the boat speed remarkably. And **** is proportional to the resistance which a hull receives from the water surface mostly, and boat speed is influenced dramatically. On the other hand, it changes with the tilt angles of the outboard motor which prepared **** of a hull in the hull tail a lot, and **** will become small if it is made to change so that **** may become large and it may be downed, if a tilt angle is changed so that the propeller of an outboard motor soffit may rise.

[0003] As conventionally proposed by JP,61-12498,A, JP,2-237893,A, etc., by using the above properties, it controls to make the tilt angle of an outboard motor into **** which makes specific fuel consumption the smallest, and the control unit which could be made to perform economical sailing is proposed. However, since **** of a hull is what changes with factors, such as a configuration of a ship's bottom, a location of a center of gravity, a situation of a load, and a class of attached outboard motor, variously, the control condition is uniformly decided to no marine vessels. Therefore, in the conventional control unit mentioned above, it cannot say that the highest effectiveness can always be demonstrated to all marine vessels, but the actual condition was able to demonstrate only the average engine performance.

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EFFECT OF THE INVENTION

[Effect of the Invention] As mentioned above, in order according to the control unit of this invention to create two or more control patterns which suit only the marine vessel concerned and to control this sailing by the learning function before this sailing with this control pattern, according to the property which each marine vessel has separately, the most efficient sailing can be secured regardless of the configuration of a hull, structure, or the class of outboard motor.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] The object of this invention solves the conventional problem mentioned above, and each marine vessel is regardless of the class of a hull, outboard motor, etc. to offer the control unit of the equipment overboard which enabled it to secure the optimal sailing according to the property which it has separately.

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MEANS

[Means for Solving the Problem] The control unit of the equipment overboard which consists of this invention which attains the above-mentioned object While attaching an outboard motor in the tail of a hull, the tilt equipment to which the outboard motor itself [this] or the flap attached independently is made to tilt is formed. In the equipment overboard which prepared the control section which operates the tilt angle of said outboard motor itself or a flap with this tilt equipment so that **** may be made the optimal according to the boat speed of a hull The learning function which makes two or more control patterns which set the optimal relation of said boat speed and said tilt angle as said control section based on **** by acceleration sailing of one or more kinds of arbitration, respectively create and memorize is made to provide. It is characterized by consisting of a configuration of performing **** control of this sailing based on two or more control patterns obtained from this learning function.

[0006] Thus, since the control pattern which suits only the marine vessel concerned by the learning function before this sailing is created, according to the property which each marine vessel has separately, the optimal sailing can be secured regardless of the configuration of a hull, structure, or the class of outboard motor.

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EXAMPLE

[Example] Drawing 1 and drawing 2 show the outline of the small marine vessel (boat) equipped with the control device of this invention. 1 is a hull, and an outboard motor 2 is attached in the center of the hull tail, and the flaps 3 and 3 of a couple use oil hydraulic cylinders 4 and 4 as tilt equipment, and it is attached in right-and-left both sides possible [tilting]. The oil hydraulic cylinders 4 and 4 on either side carry out flexible actuation, and he is trying to make flaps 3 and 3 rock by supplying hydraulic oil through solenoid valves 6 and 6 from a pump 5, respectively. The oil tank with which 7 stored hydraulic oil, and 8 are relief valves. A relief valve 8 makes excessive hydraulic oil flow back to an oil tank 7 at the time of pressure ***** predetermined in an oil hydraulic cylinder 4, and is carried out as [turn into / the internal pressure of an oil hydraulic cylinder 4 / high voltage].

[0008] 9 is the control section which consisted of microcomputers. The rate sensor 10 which detects boat speed nu, the dip sensor 11 which detects **** theta (the tilt angle of the hull to the water surface; refer to drawing 4), the throttle sensor 12 which is interlocked with a throttle 14 and detects the throttle opening gamma, the rudder angle sensor 13 which is interlocked with a handle 15 and detects a handle include angle (rudder angle alpha) are connected to a control section 9, and each detection signal is inputted into it. Moreover, a control signal is outputted to the above-mentioned pump 5 or a solenoid valve 6, with the hydraulic oil according to the control, an oil hydraulic cylinder 4 is operated and the tilt angle beta of a flap 3 (whenever [to the datum line of a hull / tilt-angle]; refer to drawing 4) is changed from a control section 9. This tilt angle beta is the initial tilt angle (criteria) beta 0. Maximum-angle-of-inclination betam It is made to have changed in the range.

[0009] 16 is a start switch and 17 is a selecting switch. Once the start switch 16 inputs into a control section 9 initiation of the data collection mentioned later, and termination and pushes them, control operation will start it, and control operation is ended if it pushes again. Moreover, a selecting switch 17 chooses whether it is adoption of collection data by the ON and OFF.

[0010] Drawing 3 shows the marine vessel equipped with the control unit which consists of other examples of this invention. With the equipment of this drawing 3 , a flap 3 is not formed, but outboard motor 2 the very thing is made to carry out tilting actuation by the oil hydraulic cylinder 4, and that tilt angle beta is changed. The tilt angle beta of this outboard motor itself is the initial tilt angle (criteria) beta 0. Maximum-angle-of-inclination betam It changes in the range.

[0011] When a control section 9 operates tilt equipments, such as a pump 5 and an oil hydraulic cylinder 4, based on the detection signal from each sensors 10, 11, 12, and 13 during sailing, the marine vessel constituted as mentioned above changes the tilt angle beta of a flap 3 or outboard motor 2 the very thing, and is controlled to make **** theta into the most efficient specific fuel consumption according to nu whenever [boat speed].

[0012] Control of **** theta by the control unit of this invention is performed by changing the tilt angle beta with the control pattern created by the learning function by ****(ing) before this sailing so that it may explain below. It carries out according to the flow chart of drawing 5 , (1) initial-data incorporation and (2) theta-nu characteristic curve are created, and the creation process of the control pattern by the learning function before performing this sailing is thetamax. It is carried out in order of creation of the control pattern which consists nu at that time of calculation and a (3) nu-beta diagram.

[0013] The first (1) initial-data incorporation usually carries out about at least two kinds of **** of acceleration and sudden acceleration, and creates the characteristic curve of time amount-**** (t-theta) respectively like drawing 6 (A), (B), and drawing 7 (A) and (B), and time amount-boat speed (t-nu). Usually thetam1 shown in drawing 6 is the max of

**** theta of an acceleration trial travel time, thetam2 is the max of a sudden acceleration trial travel time, and tm1 and tm2 are time amount until **** theta usually becomes max from the start in acceleration **** and sudden acceleration ****, respectively. Moreover, num1 shown in drawing 7 and num2 are boat speed when it has usually gone through time amount tm1 and tm2 from the start in acceleration **** and sudden acceleration ****.

[0014] Based on these collection data, the theta-nu characteristic curve of the above (2) is created as shown in drawing 8 (A) and (B), and the maximum and the boat speed nu at the time of **** theta are computed. Finally, based on these data, the control pattern (nu-beta diagram) of the above (3) is created. As this control pattern, two or more control patterns are created, for example like the pattern A for usual acceleration of drawing 9 (A), the pattern B for acceleration in drawing 9 (B), and the pattern C for sudden acceleration of (C).

[0015] According to the flow chart of drawing 5, as data collection conditions judged at step 51 when [which was mentioned above] usually carrying out acceleration **** and sudden acceleration **** ** Is the flap going up (in the case of an outboard motor)? Is it an initial sailing location? ** gear Advance or ? (in go-astern, it does not carry out) ** boat speed -- 0 (km/m) -- it is -- ? and ** throttle -- a close by-pass bulb completely -- it is -- aren't there ? and a ** wave (in order to carry out by avoiding disturbance)? ** rudder angle is 0 -- do only ? (when there is rudder angle, conditions come -- it cures -- hurt) ** loading condition-navigation person [?]? **** is taken into consideration.

[0016] If all of these conditions become yes (Yes), **** which performed push and step 52 and mentioned the switch 16 above will be performed. After ending data collection at step 53 and judging the quality of the collection data at step 54, in order to obtain the high control pattern of precision, it is good to be made to perform at least two data collection like step 55. And create two or more control patterns as mentioned above, a control section 9 is made to memorize this, and it ends.

[0017] **** control at the time of this sailing is carried out like the flow chart of drawing 10 based on two or more control patterns obtained by the above learning functions, and automatic control of the tilt angle beta of a flap or the outboard motor itself is carried out. It sails by this control by a marine vessel serving as most efficient **** according to the property in which that marine vessel carries out a proper. **** control of this sailing by the flow chart of drawing 10 is performed as follows. First, the change of **** theta based on change of loading conditions is inputted by step 101. Subsequently, **** control is carried out by step 102 only when a gear is advance. Moreover, the rudder angle alpha is the predetermined constant alpha 0 by step 103,104. It does not become above but boat speed nu is control minimum rate nus. It is made to control, whenever it is large. However, boat speed nu is control minimum rate nus. Even when small, the throttle opening gamma is predetermined opening gammam by step 105. Control is performed when large.

[0018] When the terms and conditions mentioned above are satisfied, the tilt angle beta is the initial tilt-angle constant beta 0 by the loop formation 106. A large thing is checked and setting out of the tilt angle beta of the initial position (splashdown) of a flap or an outboard motor is performed. subsequently -- a step -- 107 -- depending -- a throttle -- open -- a rate -- gamma -- ' -- open -- a rate -- a constant -- gamma -- s -- ' -- receiving -- size -- relation -- and -- a step - 108,109 -- maximum include-angle thetam of **** theta According to decision of size-related [receiving], a suitable control pattern is chosen out of two or more control patterns A, B, and C, and most efficient **** control is performed.

[0019] In addition, although two kinds such as acceleration and sudden acceleration were usually performed in the example mentioned above as **** performed by the learning function, as this ****, you may be one kind of acceleration sailing of arbitration, and from that ****, by addition or subtraction of a fixed rate, other acceleration sailing can be set up and can be made to be the same as that of the two above-mentioned kinds of cases. Naturally, three or more kinds of acceleration sailing may be made to perform a learning function.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the schematic diagram of the marine vessel equipped with the control unit by this invention.

[Drawing 2] It is II view drawing of drawing 1 .

[Drawing 3] It is the schematic diagram of the marine vessel equipped with the control unit which consists of other examples of this invention.

[Drawing 4] It is explanatory drawing explaining ****theta, the tilt angle beta, ****nu, etc.

[Drawing 5] It is a flow chart when creating a control pattern.

[Drawing 6] (A) Usually, it is the characteristic curve sheet of time amount t-**** theta by acceleration ****.

(B) It is the characteristic curve sheet of time amount t-**** theta by sudden acceleration ****.

[Drawing 7] (A) Usually, it is the characteristic curve sheet of time amount t-**** nu by acceleration ****.

(B) It is the characteristic curve sheet of time amount t-**** nu by sudden acceleration ****.

[Drawing 8] (A) Usually, it is the characteristic curve sheet of **** nu-**** theta by acceleration ****.

(B) It is the characteristic curve sheet of **** nu-**** theta ** by sudden acceleration ****.

[Drawing 9] (A), (B), and (C) — it is drawing showing the control pattern which consists of **** nu-tilt-angle beta-rays drawing, respectively.

[Drawing 10] It is the flow chart which performs **** control at the time of this sailing.

[Description of Notations]

1 Hull 2 Outboard Motor 3 Flap

4 Oil Hydraulic Cylinder (Tilt Equipment) 5 Pump

10 Speed Sensor 11 Dip Sensor 12 Throttle Sensor

13 Rudder Angle Sensor

[Translation done.]

